TECHNICAL REPORT

PS SERIES DEPLOYMENT – BOOT FROM SAN USING QLOGIC ISCSI HOST BUS ADAPTERS

ABSTRACT

This Technical Report describes the procedure to boot a Windows operating systems from a PS Series SAN volume using QLogic iSCSI HBAs.

TR1030

V2.0

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June 2009

PREFACE

Thank you for your interest in Dell™ EqualLogic™ PS Series storage products. We hope you will find the PS Series products intuitive and simple to configure and manage.

PS Series arrays optimize resources by automating volume and network load balancing. Additionally, PS Series arrays offer all-inclusive array management software, host software, and free firmware updates. The following value-add features and products integrate with PS Series arrays and are available at no additional cost:

Note: The highlighted text denotes the focus of this document.

- **PS Series Array Software**
    - **Firmware –** Installed on each array, this software allows you to manage your storage environment and provides capabilities such as volume snapshots, clones, and replicas to ensure data hosted on the arrays can be protected in the event of an error or disaster.
        - **Group Manager GUI:** Provides a graphical user interface for managing your array
        - **Group Manager CLI:** Provides a command line interface for managing your array.
    - **Manual Transfer Utility (MTU):** Runs on Windows and Linux host systems and **e**nables secure transfer of large amounts of data to a replication partner site when configuring disaster tolerance. You use portable media to eliminate network congestion, minimize downtime, and quick-start replication.
- **Host Software for Windows**
    - **Host Integration Tools**
        - **Remote Setup Wizard (RSW):** Initializes new PS Series arrays, configures host connections to PS Series SANs, and configures and manages multipathing.
        - **Multipath I/O Device Specific Module (MPIO DSM):** Includes a connection awareness-module that understands PS Series network load balancing and facilitates host connections to PS Series volumes.
        - **VSS and VDS Provider Services:** Allows 3rd party backup software vendors to perform off-host backups.
        - **Auto-Snapshot Manager/Microsoft Edition (ASM/ME):** Provides point-in-time SAN protection of critical application data using PS Series snapshots, clones, and replicas of supported applications such as SQL Server, Exchange Server, Hyper-V, and NTFS file shares.
    - **SAN HeadQuarters (SANHQ):** Provides centralized monitoring, historical performance trending, and event reporting for multiple PS Series groups.
- **Host Software for VMware**
    - **Storage Adapter for Site Recovery Manager (SRM):** Allows SRM to understand and recognize PS Series replication for full SRM integration.
    - **Auto-Snapshot Manager/VMware Edition (ASM/VE):** Integrates with VMware Virtual Center and PS Series snapshots to allow administrators to enable Smart Copy protection of Virtual Center folders, datastores, and virtual machines.
    - **MPIO Plug-In for VMware ESX:** Provides enhancements to existing VMware multipathing functionality.

Current Customers Please Note: You may not be running the latest versions of the tools and software listed above. If you are under valid warranty or support agreements for your PS Series array, you are entitled to obtain the latest updates and new releases as they become available.

To learn more about any of these products, contact your local sales representative or visit the Dell™ EqualLogic™ site at http://www.equallogic.com. To set up a Dell EqualLogic support account to download the latest available PS Series firmware and software kits visit: https://www.equallogic.com/secure/login.aspx?ReturnUrl=%2fsupport%2fDefault.aspx

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REVISION INFORMATION

The following table describes the release history of this Technical Report.

Report	Date	Document Revision
1.0	March 2007	Initial Release
2.0	June 2009	Updates with new Dell template

QLOGIC REVISION INFORMATION

The following table lists the revisions of the QLogic BIOS, Firmware, SANsurfer Manager, and the Windows Driver used in the preparation of this report.

HBA Models	BIOS	Firmware	Windows Driver
QLA4050, QLA4050C, QLA4052C, QLA4060C, QLA4062	1.14	3.0.1.49	2.1.4.19

WINDOWS 2003 REVISION INFORMATION

The following table reflects the service pack revision for the Windows Server 2003 operating system used to prepare this report.

Vendor	Model	Software Revision
Microsoft®	Windows® Server & Storage Server 2003	SP1, SP2, R2, R2 SP2

PS SERIES SOFTWARE REVISION INFORMATION

The following table reflects the revision information of Dell EqualLogic product software and firmware supported for this configuration.

PS Series Firmware	Host Integration Tools
V3.2.8 or later	HIT v3.0 or later

INTRODUCTION

This Technical Report describes the steps for configuring a QLogic Host Bus Adapter (HBA) to boot from an iSCSI volume in a PS Series group (Figure 1). This configuration improves server operations by placing the operating system on a highly available SAN with snapshot and replication capabilities. The result is improved server management and the ability to recover quickly in the event of server hardware failure.

The procedures in this report show you how to:

- Prepare a PS Series group volume.
- Configure the QLogic HBA.
- Install the Windows 2003 operating system onto the volume.
- Successfully boot the operating system from the SAN environment.
- Configure a second HBA port or an additional HBA.

The example in this report will create a single 5GB PS Series boot volume.

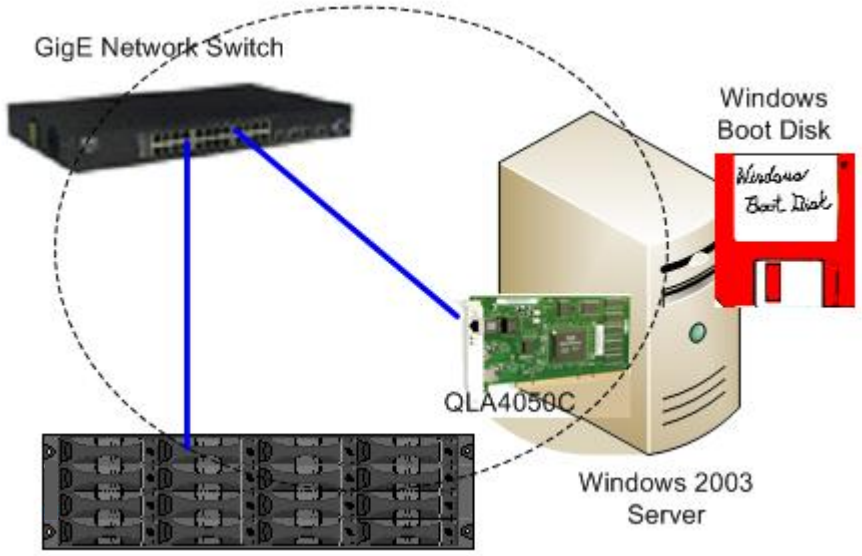

Figure 1: QLogic SAN Boot Configuration

SERVER AND GROUP REQUIREMENTS

This Technical Report assumes that the user has basic familiarity with PS Series group setup and management using the Group Manager Graphical User Interface (GUI). The user should also be comfortable with creating and connecting to group volumes and displaying connection status.

The PS Series group must be previously configured with IP, subnet, and gateway addresses that will be accessible by the QLogic HBA once it is configured as described in this report.

The procedures described in this report were conducted with a dual 2.4GHZ x86 server platform with 1GB of main memory. The QLogic QLA4052C iSCSI HBA was used and configured in the server. This configuration satisfied the QLogic SAN boot requirements. Also, the server BIOS was verified as up-to-date and able to support a SAN boot.

Note: The server must have a 3.25" floppy disk drive and a bootable CD-ROM or DVD drive to be used for the <F6> driver load during the Windows 2003 installation.

Network access between the PS Series group and the server will be provided through a Gigabit Ethernet network switch. Be sure to configure the switch according to guidelines provided in the Technical Report, *Storage Array Network Performance Guidelines* available on the EqualLogic Support website.

The latest QLogic Windows SCSIport Miniport Driver files must be available and extracted to a 3.25" floppy disk. You can obtain this self-extracting kit from the QLogic website.

A Windows Server 2003 CD and valid license key are required during the Windows installation portion of this report.

STEPS FOR BOOTING FROM THE SAN

The basic steps for booting from a PS Series group SAN are as follows:

1. **Set up the iSCSI volume**. Using the Group Manager GUI or CLI (the GUI is used in this report), create and prepare the volume that will be used as the SAN boot device.
2. **Prepare the boot server**. This step includes installing the HBA and loading the HBA driver and operating system disks.
3. **Configure the HBA parameters**. This step will be broken down into separate activities, which include enabling the HBA BIOS, providing the correct IP information for the iSCSI initiator, enabling the iSCSI boot capability of the HBA, setting the PS Series group IP address, and selecting the correct iSCSI target name for the operating system boot.
4. **Install Windows 2003**. During this step, the boot server is rebooted, allowing the Windows 2003 distribution CD or DVD to boot and begin the operating system load to the PS Series group boot volume.
5. **Verify the configuration**. After the Windows 2003 installation has finished and you have rebooted the server and completed final installation activities, you can install the QLogic SANsurfer Manager and complete final system checks.

Setting up the iSCSI Boot Volume

You can access and manage a PS Series group using the Group Manager GUI (through an Internet browser connection to the group IP address) or the CLI (through a telnet or SSH connection to the group IP address or through a serial connection to an array). Once connected, log in using `grpadmin` or another group administration account that has read-write privileges.

To use the GUI to set up the iSCSI volume that will be the boot device, follow these steps:

1. In the Activities panel of the GUI under Getting Started, click **Create Volume**. A dialog box will open as shown in Figure 2. Specify the name of the boot volume and the volume size in step 2 of the Create Volume wizard, Figure 3.

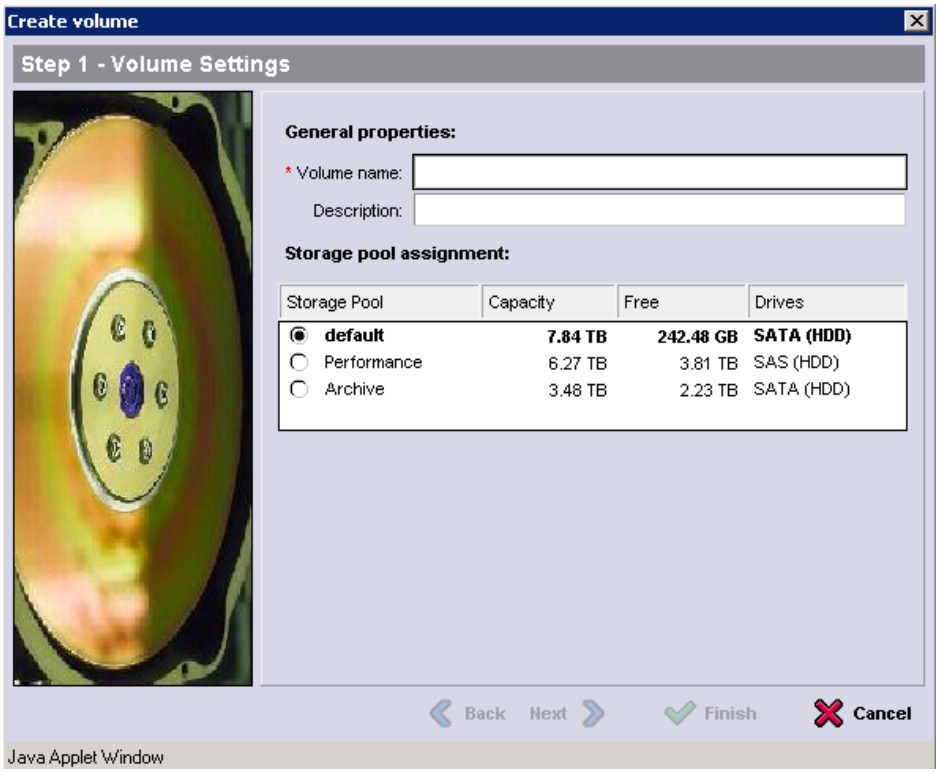

Figure 2: Volume Creation – Step 1

Dell suggests a minimum boot volume size of 20GB. It is also recommend using the default 100% Snapshot Reserve size for volume protection with SAN snapshots. Further, it is recommended to create regular snapshots of the boot volume for ongoing protection.

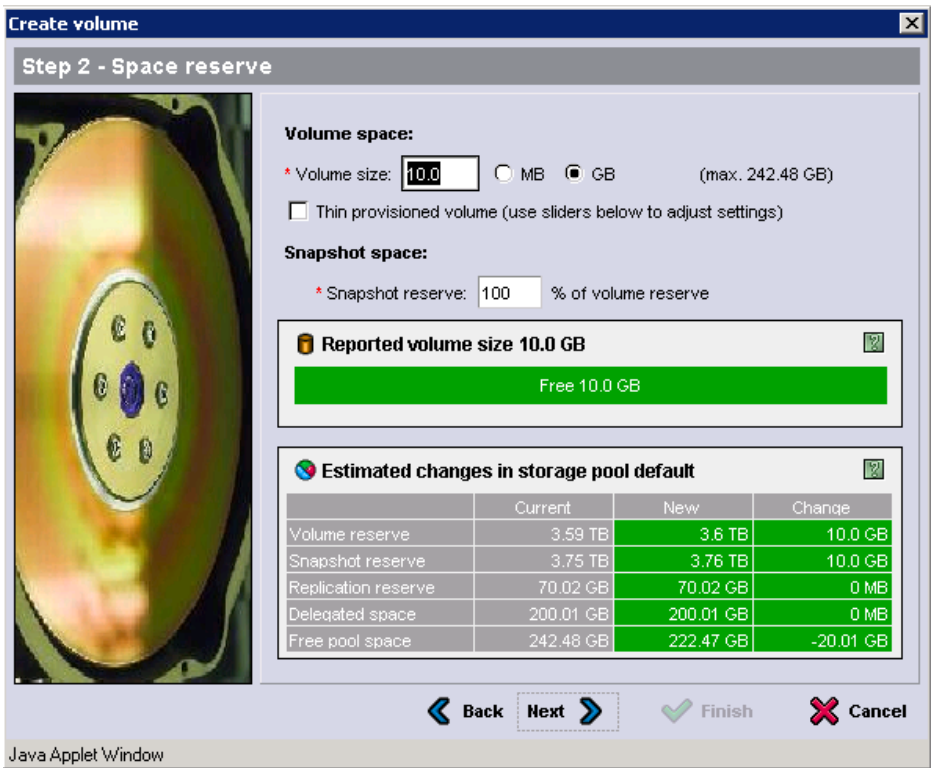
Create volume
Step 2 - Space reserve
Volume space:
* Volume size: 10.0 MB GB (max. 242.48 GB)
Thin provisioned volume (use sliders below to adjust settings)
Snapshot space:
* Snapshot reserve: 100 % of volume reserve
Reported volume size 10.0 GB
Free 10.0 GB
Estimated changes in storage pool default
Current New Change
Volume reserve 3.59 TB 3.6 TB 10.0 GB
Snapshot reserve 3.75 TB 3.76 TB 10.0 GB
Replication reserve 70.02 GB 70.02 GB 0 MB
Delegated space 200.01 GB 200.01 GB 0 MB
Free pool space 242.48 GB 222.47 GB -20.01 GB
Back
Next
Finish
Cancel
Java Applet Window

Figure 3: Volume Creation – Step 2

2. After specifying the information, click **Next** to display the Create volume – iSCSI Access dialog box.

   The Create volume – iSCSI Access dialog box enables you to restrict access to the volume by creating an access control record. It is a good practice to protect and limit boot volume access only to the QLogic HBA that will be connecting to this target. Each HBA will have a unique initiator name for IP address for each port. In addition CHAP authentication can be set through the HBA. This dialog box enables you to limit volume access using CHAP, the iSCSI initiator IP address, or the iSCSI initiator name, as shown in Figure 4.

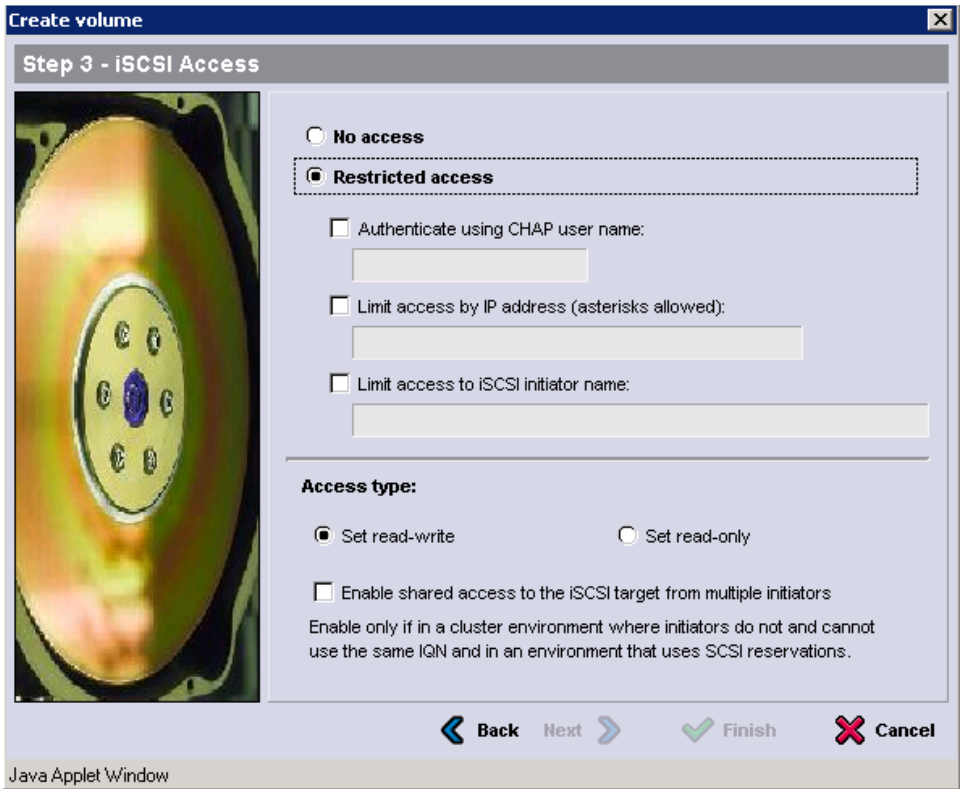
Create volume
Step 3 - iSCSI Access
No access
Restricted access
Authenticate using CHAP user name:
Limit access by IP address (asterisks allowed):
Limit access to iSCSI initiator name:
Access type:
Set read-write
Set read-only
Enable shared access to the iSCSI target from multiple initiators
Enable only if in a cluster environment where initiators do not and cannot use the same IQN and in an environment that uses SCSI reservations.
Back
Next
Finish
Cancel
Java Applet Window

Figure 4: Step 3 – Limiting access to the Boot volume

3. Select the desired access method and then click **Next** to display the summary dialog box.
4. Check the volume parameters displayed in the summary dialog box. If the information is correct, click **Finish**.

The boot volume is now ready for the operating system installation.

Prepare the Boot Server

To set up the boot server, follow these steps:

1. As noted in *Server and Group Requirements*, the server should contain a bootable CD or DVD drive and a 3.5” floppy drive. Using the server’s BIOS setup utility, ensure that the CD or DVD drive is bootable, is configured as drive C:, and comes before the floppy drive and direct-attached IDE or SCSI disk drives in the boot order. It may be necessary to disable any other direct-attached disks on the server to accomplish this.
2. Follow the directions provided in the HBA users guide and install the HBA.
3. Obtain the QLogic Miniport driver kit from either the QLogic website or from the distribution CD that is included with the HBA. Follow the instructions provided with the kit to extract the files to a 3.5” floppy disk.
4. Insert the floppy disk created during the previous step into the server’s floppy drive.
5. Insert the Windows Server 2003 distribution disc into the server’s CD drive.
6. Shut down and turn off power to the server.

Configuring the QLogic HBA

At this time, the boot server has been prepared according to the instructions in *Prepare the Boot Server* and should be powered off with the QLogic driver floppy disk and the Windows Server 2003 distribution disc installed in their respective drives.

Follow the steps below to set up the QLA405x HBA:

1. Turn on power to the server and be prepared to press **<CTRL>** + **Q** as soon as the QLogic Corporation banner is displayed (as shown in the example in Figure 5).

QLogic Corporation
QLA4010 iSCSI ROM BIOS Version 1.11
Copyright (C) QLogic Corporation 1993-2004. All rights reserved.
www.qlogic.com
Press <CTRL-Q> for Fast!UTIL
BIOS for Adapter 0 is disabled
<CTRL-Q> Detected, Initialization in progress, Please wait...
ROM BIOS NOT INSTALLED

Figure 5: Entering the QLogic Fast!UTIL Setup program

   A few seconds after you do this, the Fast!UTIL setup menu appears.

2. From the Fast!UTIL Options menu, select Configuration Settings. This opens the Configuration Settings menu. Select Host Adapter Settings to open the Host Adapter Settings screen shown in Figure 6.

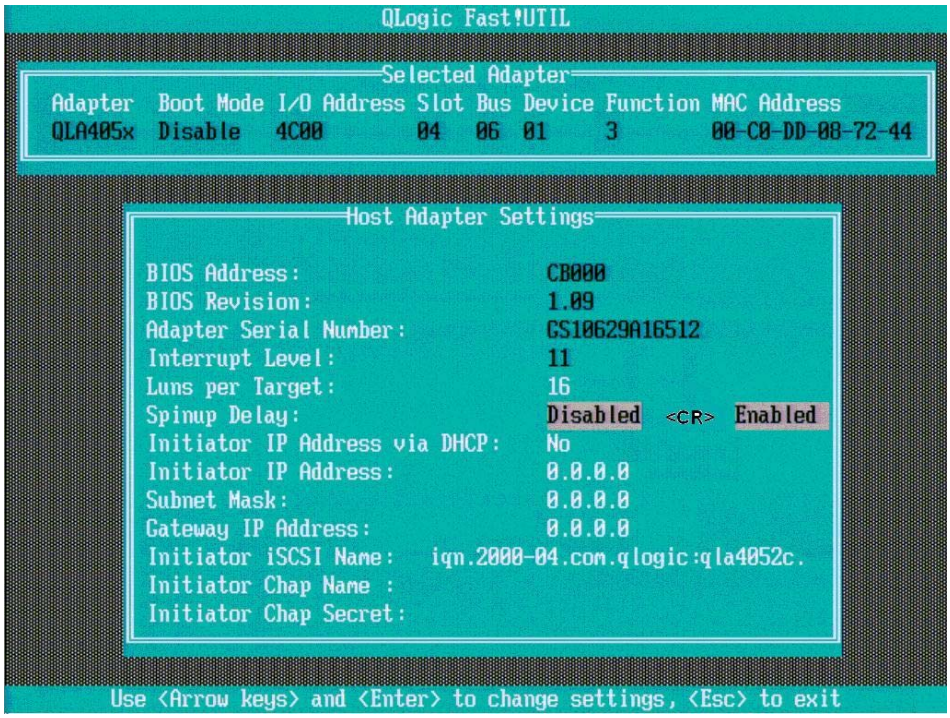
QLogic Fast!UTIL
Selected Adapter
Adapter Boot Mode I/O Address Slot Bus Device Function MAC Address
QLA405x Disable 4C00 04 06 01 3 00-C0-DD-08-72-44
Host Adapter Settings
BIOS Address: CB000
BIOS Revision: 1.09
Adapter Serial Number: GS10629A16512
Interrupt Level: 11
Luns per Target: 16
Spinup Delay: Disabled <CR> Enabled
Initiator IP Address via DHCP: No
Initiator IP Address: 0.0.0.0
Subnet Mask: 0.0.0.0
Gateway IP Address: 0.0.0.0
Initiator iSCSI Name: iqn.2000-04.com.qlogic:qla4052c.
Initiator Chap Name :
Initiator Chap Secret:
Use <Arrow keys> and <Enter> to change settings, <Esc> to exit

Figure 6: The Host Adapter Settings screen.

3. Verify that the QLA405x is loaded with the minimum revision of 1.09.
4. Enable the Spinup Delay. In some network configurations the iSCSI target may not be discovered at boot time; enabling the Spinup Delay setting eliminates this problem.
5. Enter the Initiator IP Address (Figure 7), the address assigned specifically to the QLogic HBA.

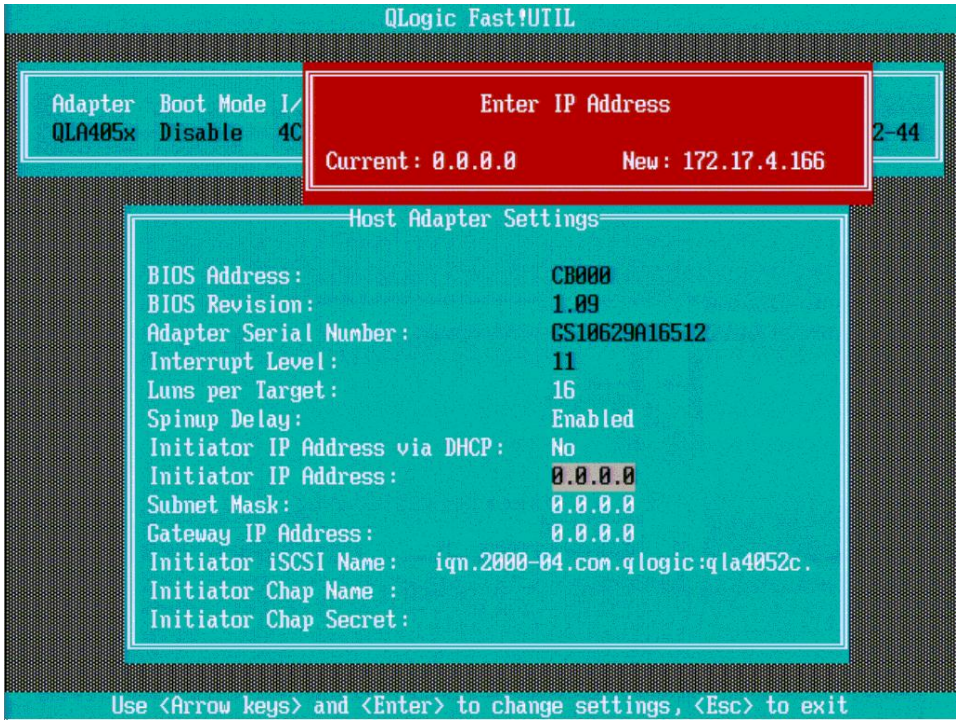

Figure 7: Entering the IP address for the QLogic initiator

6. Enter the subnet mask address (netmask).
7. Enter the gateway IP address (if required).
8. If desired, configure the CHAP user name and password (secret) at this time. For more information on using CHAP with PS Series groups, see the *Group Administration* manual.
9. Once the QLA405x BIOS is enabled and the network address information entered, press <Esc> twice. When prompted, select **Save Changes** to commit the changes. Expect a delay of five to ten seconds while the data is being saved. The Fast!UTIL option screen appears when the save is complete.
10. Select **Configuration Settings**, then **iSCSI Boot Settings**. The iSCSI Boot Settings menu appears, as shown in Figure 8. Use the Tab key to navigate to the **Adapter Boot Mode** field and press Enter. Set the Boot Mode to **Manual**.

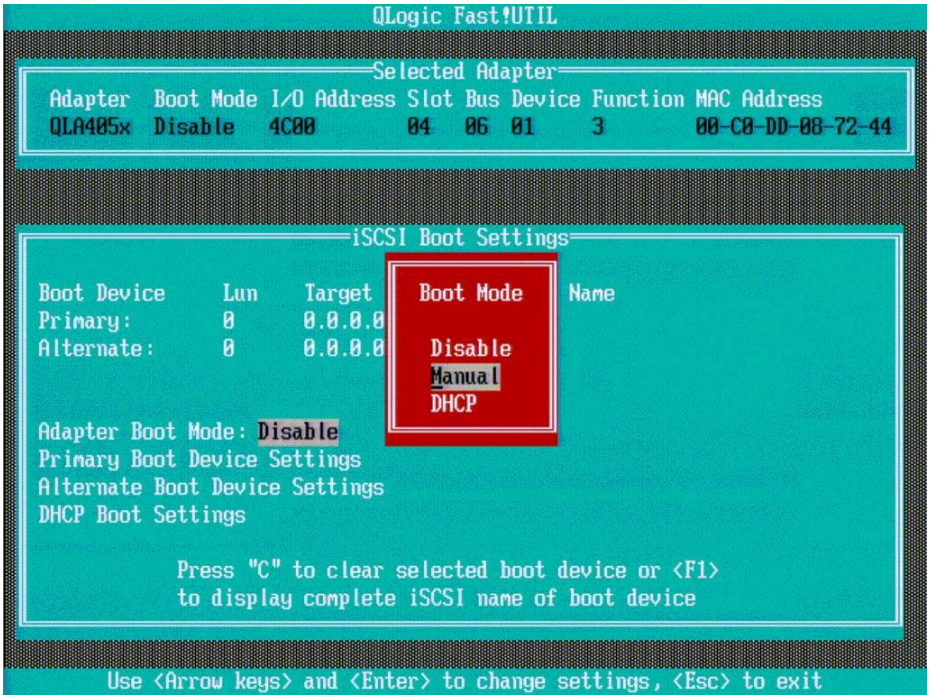
QLogic Fast!UTIL
Selected Adapter
Adapter Boot Mode I/O Address Slot Bus Device Function MAC Address
QLA405x Disable 4C00 04 06 01 3 00-C0-DD-08-72-44
iSCSI Boot Settings
Boot Device Lun Target
Primary: 0 0.0.0.0
Alternate: 0 0.0.0.0
Boot Mode
Disable
Manual
DHCP
Name
Adapter Boot Mode: Disable
Primary Boot Device Settings
Alternate Boot Device Settings
DHCP Boot Settings
Press "C" to clear selected boot device or <F1>
to display complete iSCSI name of boot device
Use <Arrow keys> and <Enter> to change settings, <Esc> to exit

Figure 8: Enabling Boot Mode on the iSCSI Boot Settings screen.

11. Navigate to **Primary Boot Device Settings**. Press Enter to open the Primary Boot Device Settings screen shown in Figure 9. Select the **Target IP** option and press Enter. Enter the PS Series group IP Address in the popup that appears. You do not have to change the Target Port or Boot LUN settings.

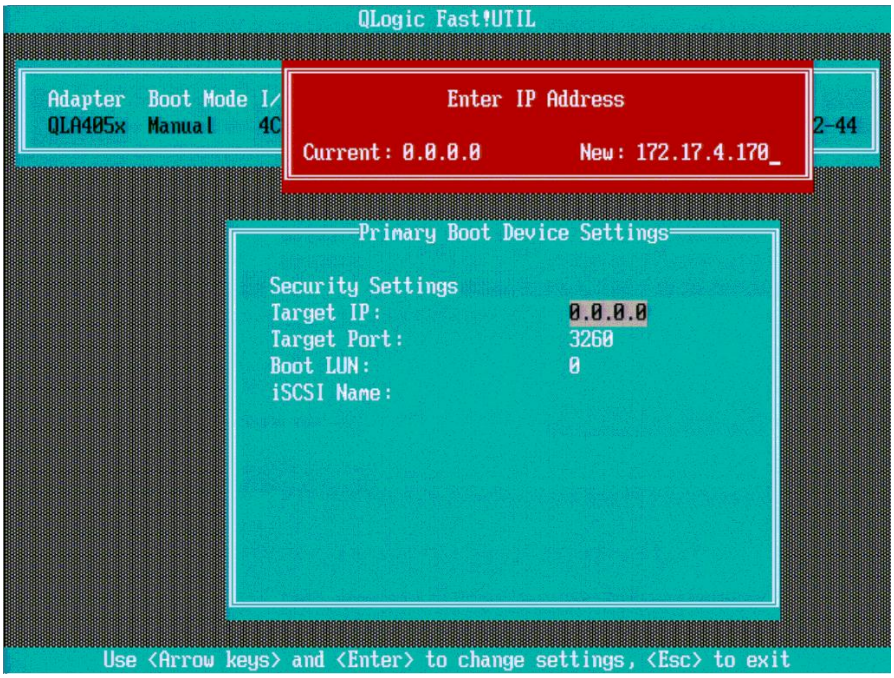

Figure 9: Adding the PS Series Group IP address

12. Press the Escape key three (3) times and select the **Save Changes** option on the **Configuration settings modified** screen. Save your changes.

13. Select the Primary field by pressing ENTER. A new window appears listing all iSCSI targets that were discovered after the save operation (Figure 10). Select a LUN and press the <F1> key to see the full iSCSI target name for the boot volume (Figure 11).

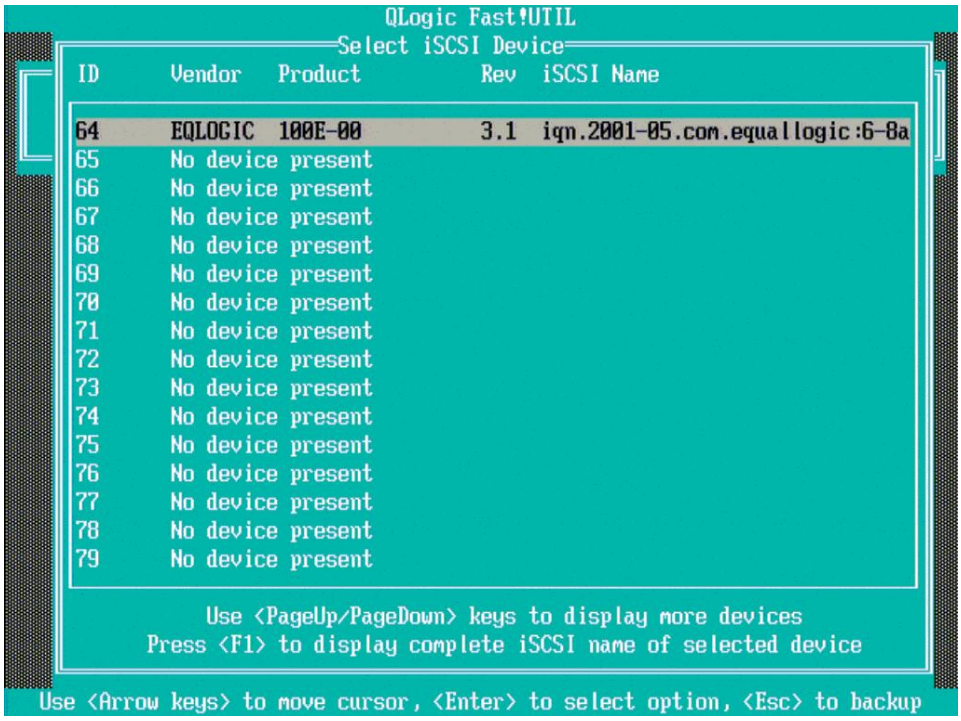
QLogic Fast!UTIL
Select iSCSI Device
ID Vendor Product Rev iSCSI Name
64 EQLOGIC 100E-00 3.1 iqn.2001-05.com.equallogic:6-8a
65 No device present
66 No device present
67 No device present
68 No device present
69 No device present
70 No device present
71 No device present
72 No device present
73 No device present
74 No device present
75 No device present
76 No device present
77 No device present
78 No device present
79 No device present
Use <PageUp/PageDown> keys to display more devices
Press <F1> to display complete iSCSI name of selected device
Use <Arrow keys> to move cursor, <Enter> to select option, <Esc> to backup

Figure 10: Verifying that the Boot Volume has been Discovered and Connected

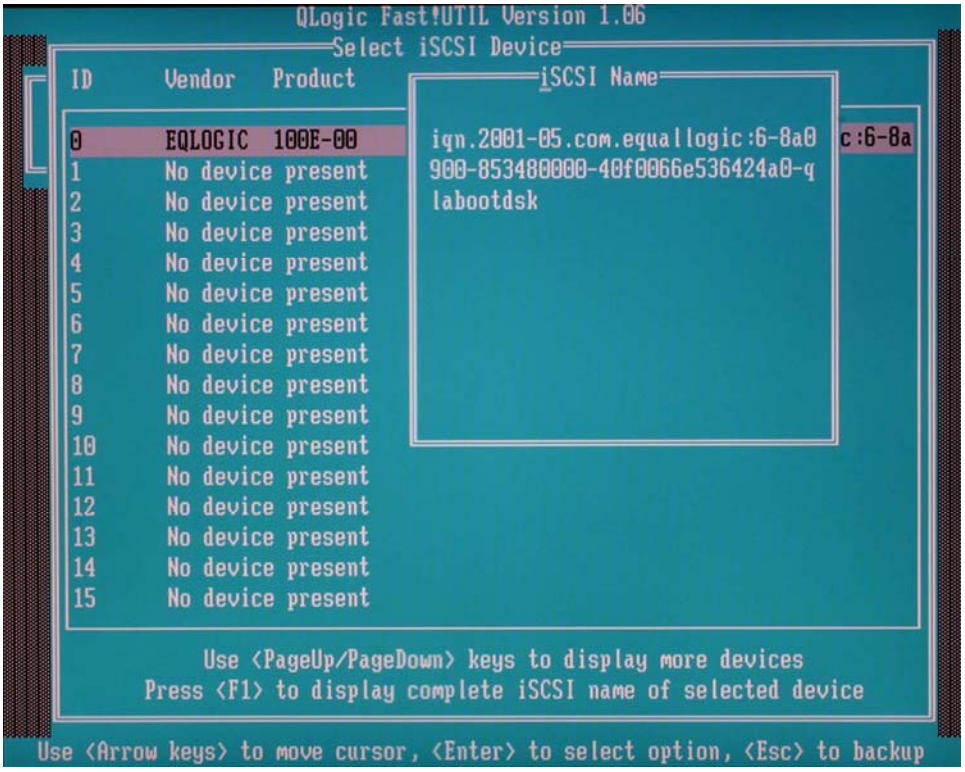

Figure 11: Using the F1 key to expand the iSCSI Target name

14. Press the Enter key to commit this volume for use as the Primary Boot Volume. The iSCSI target name will now be displayed in the iSCSI Boot Settings menu as in Figure 12.

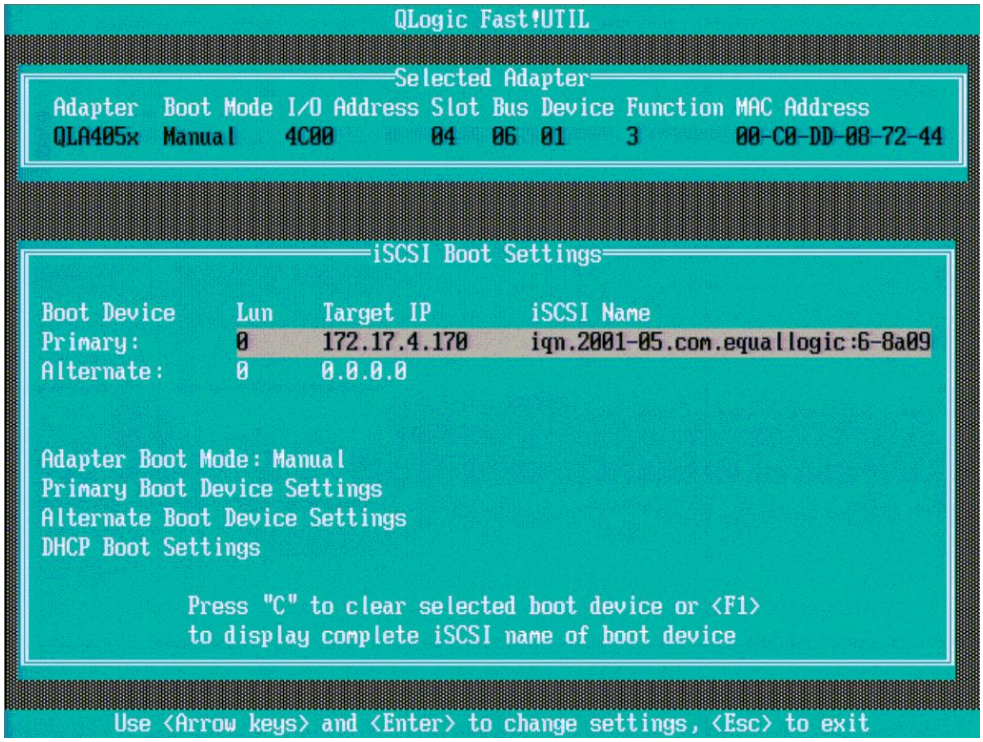
QLogic Fast!UTIL
Selected Adapter
Adapter Boot Mode I/O Address Slot Bus Device Function MAC Address
QLA405x Manual 4C00 04 06 01 3 00-C0-DD-08-72-44
iSCSI Boot Settings
Boot Device Lun Target IP iSCSI Name
Primary: 0 172.17.4.170 iqn.2001-05.com.equallogic:6-8a09
Alternate: 0 0.0.0.0
Adapter Boot Mode: Manual
Primary Boot Device Settings
Alternate Boot Device Settings
DHCP Boot Settings
Press "C" to clear selected boot device or <F1>
to display complete iSCSI name of boot device
Use <Arrow keys> and <Enter> to change settings, <Esc> to exit

Figure 12: iSCSI target name as Primary Boot volume

15. Complete the iSCSI boot setup operation by pressing the <ESC> key twice to recall the save settings option. Save the changes then press the <ESC> key one more time to select **Reboot System**. Before rebooting the server, verify that the QLogic Driver Disk and the Windows 2003 Distribution are located in their respective drives. Be prepared to press the <F6> key because the QLogic QLA40xx.sys driver will be required during the Windows installation.

Installing Windows 2003

Perform the following steps to install Windows 2003:

1. If the QLA405x iSCSI boot setup was completed correctly, during the server reboot you should see the boot volume listed at POST time. The boot volume will be listed as Type - Disk, Vendor ID - EQLOGIC.

2. Immediately following POST, if the Windows 2003 distribution is available and bootable, the Windows Setup screen (Figure 12, Window 1) appears. You have a short period of time to press the <F6> key to load the QLogic QLA405x driver.

3. Once the <F6> interrupt has been trapped, the next screen displayed (Figure 12 – Window 2) requires additional user input to specify the QLA40xx driver. Enter the letter S to indicate a driver not supplied in the Windows distribution. The QLA40xx driver will be loaded from the disk located in the floppy drive.

4. After the QLA40xx driver has been loaded successfully, the next screen (Figure 13 – Window 3), will display the QLogic iSCSI Adapter.

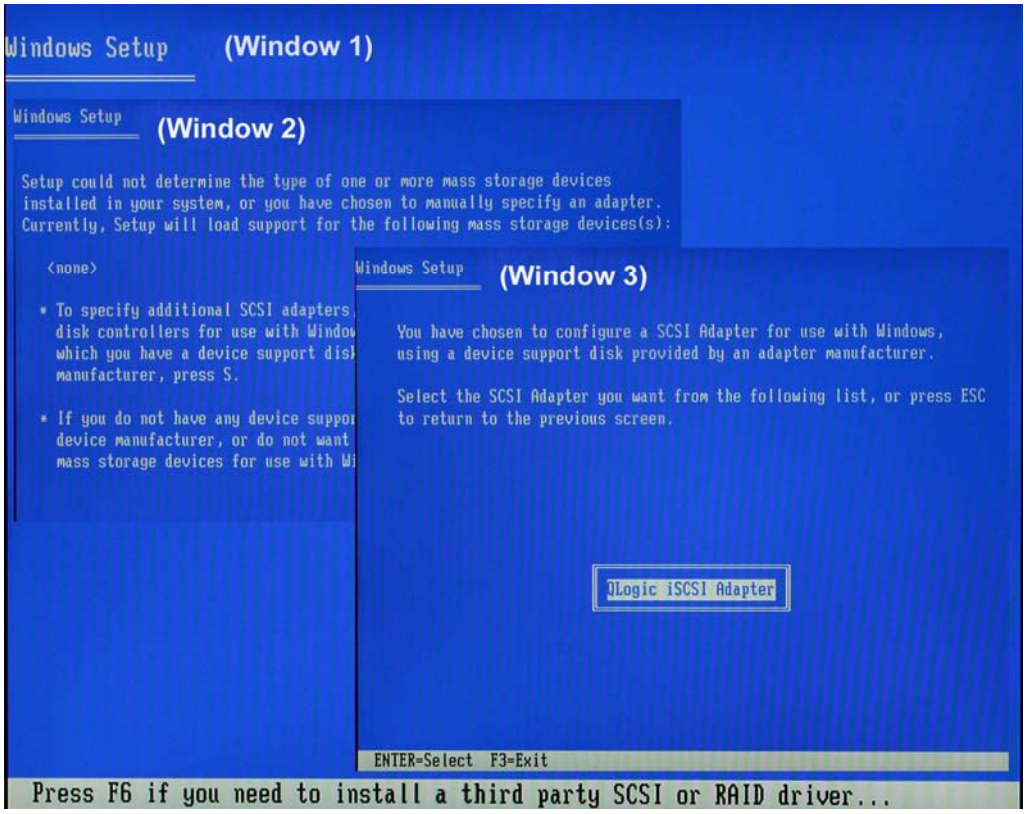
Windows Setup
(Window 1)
Windows Setup
(Window 2)
Setup could not determine the type of one or more mass storage devices
installed in your system, or you have chosen to manually specify an adapter.
Currently, Setup will load support for the following mass storage devices(s):
<none>
* To specify additional SCSI adapters,
disk controllers for use with Windo
which you have a device support dis
manufacturer, press S.
* If you do not have any device suppo
device manufacturer, or do not want
mass storage devices for use with W
Windows Setup
(Window 3)
You have chosen to configure a SCSI Adapter for use with Windows,
using a device support disk provided by an adapter manufacturer.
Select the SCSI Adapter you want from the following list, or press ESC
to return to the previous screen.
QLogic iSCSI Adapter
ENTER=Select F3=Exit
Press F6 if you need to install a third party SCSI or RAID driver...

Figure 13: Loading the QLA40xx driver

5. From this point forward, the Windows 2003 installation continues in the standard manner. Follow the on-screen directions to complete the installation.

Verifying the Configuration

Once the Windows Server 2003 installation has been completed and the server has rebooted using the newly installed operating system, complete the following steps to finish the PS Series group SAN boot procedure.

1. Check for unexpected events in the Windows Event Viewer and check that the server reboots quickly and as expected.

2. Install the QLogic SANsurfer Manager provided on the CD that is supplied with the QLA405x kit or download the application from the QLogic website.

3. After the SANsurfer has been installed you can manage additional iSCSI data volumes that have been created using the PS Series Group Manager GUI or CLI.

4. Other post-SAN boot setup activities should include:

    a. Connecting a second boot path if available for high availability to the boot volume.

    b. With the server shutdown so that the boot volume is in a static state, create a snapshot of the boot volume. This will provide an original backup of the boot volume.

c. During events that will cause loss of connection to the SAN boot volume, (for example during a firmware upgrade of the PS Series array), if the servers Disk TimeOutValue setting is less than 120 seconds then write errors followed by a server crash may occur. In order to prevent the server from crashing increase the default value of the following registry data value to a minimum of 120 (78 hex) seconds.

```
HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Disk\
      TimeOutValue
```

d. Any switch ports connected to PS Series arrays, or to NICs or HBAs carrying iSCSI traffic, should be set so that link transitions on that port will not trigger a full spanning-tree recalculation. Cisco calls this setting "portfast"; other vendors use the terms "end node", "edge node" or "edge port".

Installing and Configuring the Second HBA Port

If you have a QLA4052 or (2) QLA4050 HBAs installed, you can configure the second HBA port for redundant boot paths. The following steps outline the process for adding the second HBA port to the boot volume. It's recommended to install the EqualLogic Host Integration Tools at this point.

1. The first thing you need to do is install the Multipath I/O DSM on the server. Obtain the Multipath I/O DSM from the Microsoft iSCSI Initiator Software at the link below and install the updated iSCSI Initiator software. Be sure to check the box for Microsoft MPIO Multipathing Support for iSCSI.

   http://www.microsoft.com/downloads/details.aspx?FamilyID=12cb3c1a-15d6-4585-b385-befd1319f825&DisplayLang=en

2. Reboot the server as requested.

3. Ensure MPIO has selected the boot volume. Open up the Microsoft iSCSI Initiator service located on the desktop of your system. Select Targets tab and locate the boot volume. Click the Details button to open up target properties. Select the Device tab, highlight one of the device names, and click the advanced tab as in Figure 14. If the MPIO driver has worked correctly you will see *mpio* in front of the Device Interface Name. If not Log On to the volume from the iSCSI Initiator Properties window and enable Multi-path support.

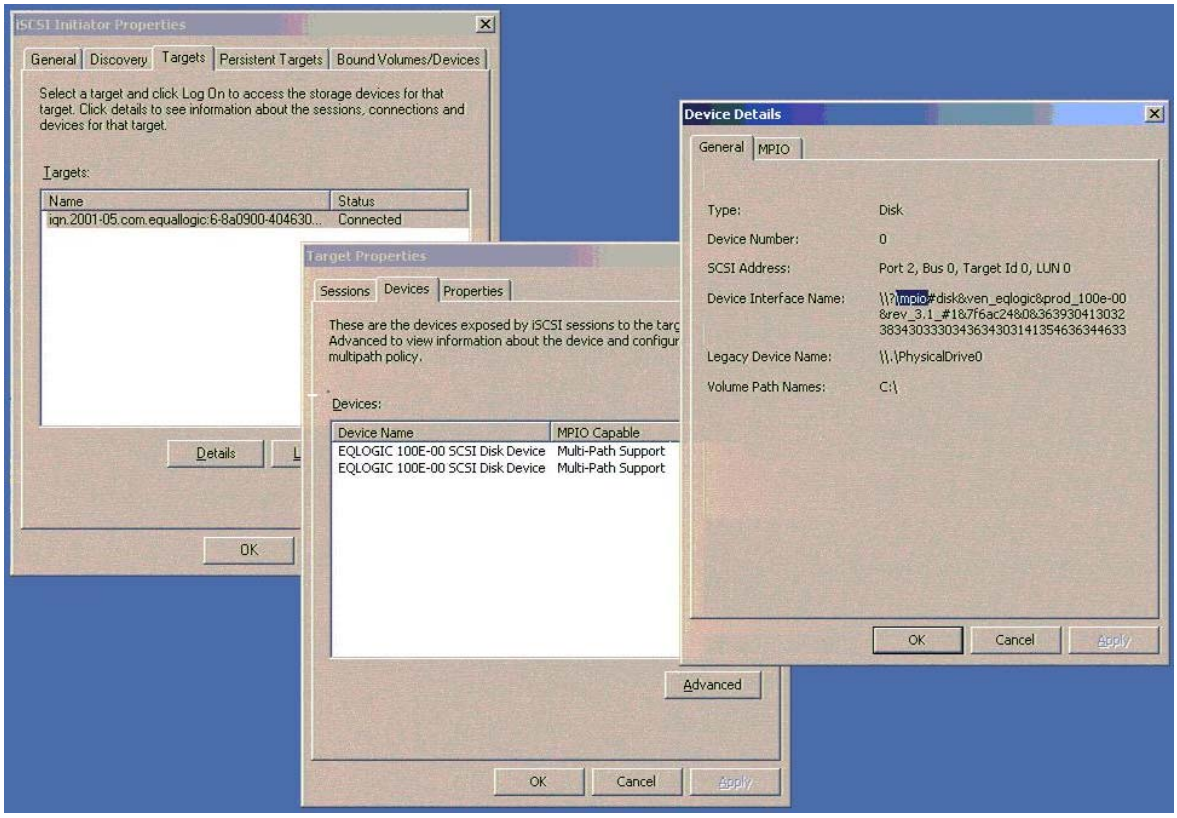

Figure 14: Correct operation of the Microsoft MPIO driver

4. You will have to grant the second HBA access to the boot volume through the EqualLogic PS series group manager GUI. You do this by opening the **Access** tab of the volume and adding the IP address of the second HBA as in Figure 15.

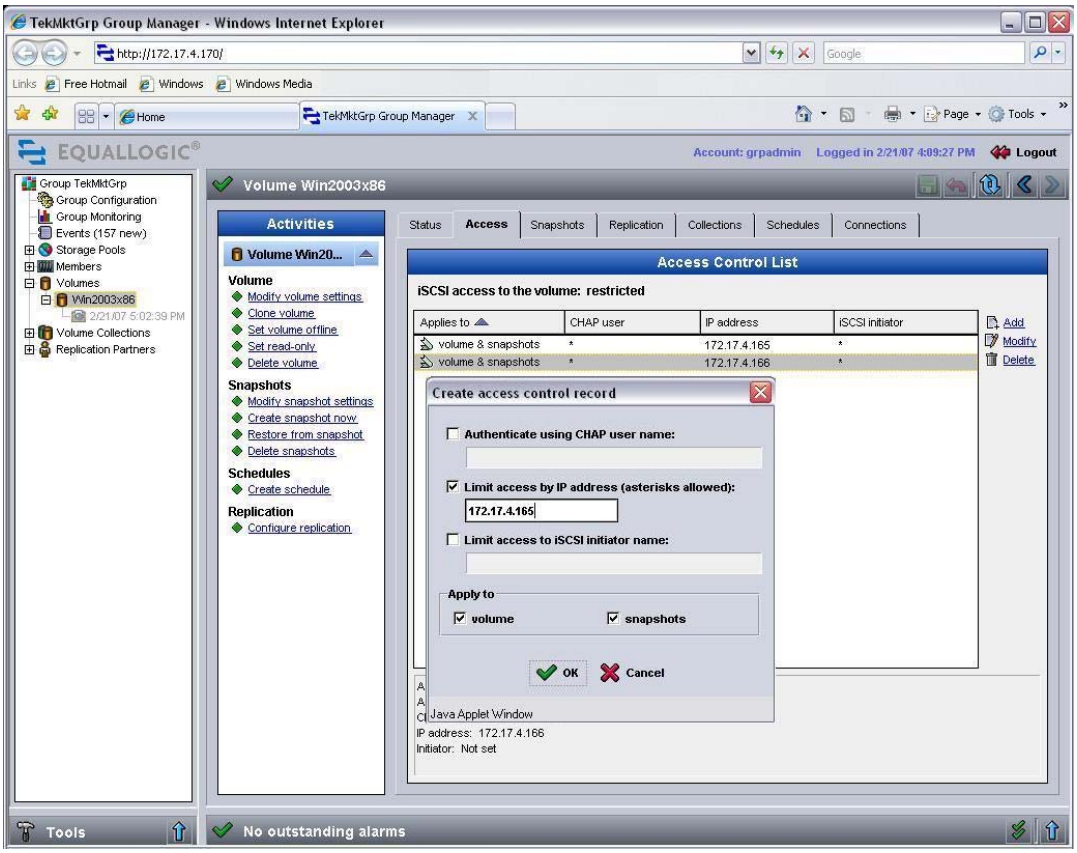

Figure 15: Granting the second HBA access to the Boot volume

5. After adding access to the second HBA port, reboot the system and follow the steps outlined in Configuring the QLA405x HBA.

6. Once the system reboots and the Windows OS comes up you will be prompted by the MPIO driver that it has installed new devices and needs an additional reboot. Reboot the system as needed.

FOR MORE INFORMATION

For detailed information about PS Series arrays, groups, and volumes see the following documentation:

- *Release Notes*. Provides the latest information about PS Series storage arrays and groups.
- *QuickStart*. Describes how to set up the hardware and start using a PS Series storage array.
- *Group Administration*. Describes how to use the Group Manager GUI to manage a PS Series group. This manual provides comprehensive information about product concepts and procedures.
- *CLI Reference*. Describes how to use the Group Manager command line interface to manage a group and individual arrays.
- *Hardware Maintenance*. Provides information on maintaining the PS Series storage array hardware.

The *QuickStart* and *Hardware Maintenance* manuals are printed and shipped with the PS Series array.
They are also located on the documentation CD-ROM that is shipped with the array, along with the *Group Administration* and *CLI Reference* manuals and the Group Manager online help.

The Host Integration Tools kit and documentation will be available on the support website (`support.dell.com/EqualLogic`) and on a CD-ROM that is shipped with the PS Series array.

TECHNICAL SUPPORT AND CUSTOMER SERVICE

Dell's support service is available to answer your questions about PS Series arrays. If you have an Express Service Code, have it ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Contacting Dell

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area.

For customers in the United States, call 800-945-3355.

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To contact Dell for sales, technical support, or customer service issues:

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2. Verify your country or region in the Choose A Country/Region drop-down menu at the bottom of the window.

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4. Select the appropriate service or support link based on your need.

5. Choose the method of contacting Dell that is convenient for you.

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